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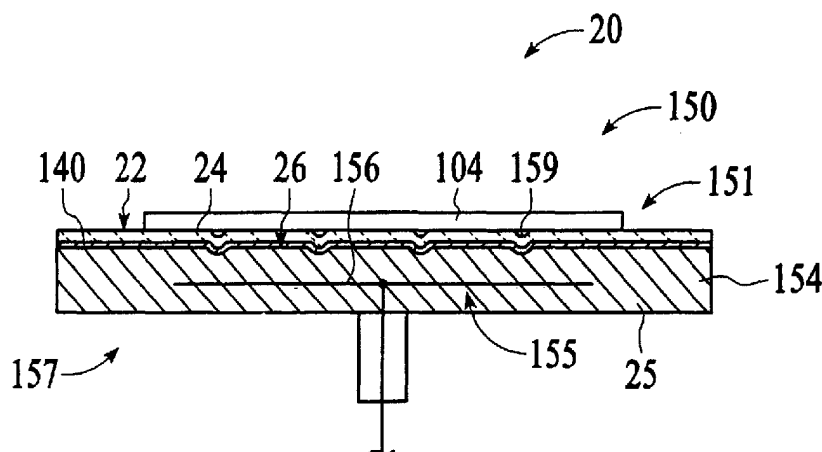
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(54) Title: **CONTAMINANT REDUCING SUPPORT SYSTEM**



(57) Abstract: A substrate support has a support structure and a coating on the support structure having a carbon-hydrogen network. The coating has a contact surface having a coefficient of friction of less than about 0.3 and a hardness of at least about 8 GPa. The contact surface of the coating is capable of reducing abrasion and contamination of a substrate that contacts the contact surface. In one version, the support structure has a dielectric covering an electrode. A plurality of mesas on the dielectric have a coating with the contact surface thereon. In another version, contamination of substrate is reduced by providing a substrate lifting assembly having a pair of arcuate fins with raised protrusions to support the substrates.



CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2005/005672

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L21/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| Y | WO 02/01611 A (APPLIED MATERIALS, INC) 3 January 2002 (2002-01-03) page 11, line 13 - line 35; figures 1,4 ----- | 1-25,52, 53 |
| Y | US 5 352 493 A (DORFMAN ET AL) 4 October 1994 (1994-10-04) cited in the application column 1, lines 8-18 - column 1, lines 45-48; figure 1A; example 1 ----- | 1-25,52, 53 |
| Y | US 6 228 471 B1 (NEERINCK DOMINIQUE ET AL) 8 May 2001 (2001-05-08) cited in the application column 1, lines 38-49 - column 6, lines 24-67 ----- -/-- | 1-25,52, 53 |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | US 5 812 362 A (RAVI ET AL) 22 September 1998 (1998-09-22) column 6, line 4 - column 7, line 41; figures 2,3 | 1-25,52, 53 |
| P,A | US 2004/055709 A1 (BOYD WENDELL G ET AL) 25 March 2004 (2004-03-25) paragraphs [0021], [0029], [0030]; figure 3a | 1-25,52, 53 |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2005/005672

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-25, 52, 53

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-25, 52, 53

This invention concerns a substrate support structure comprising a body and a diamond-like coating on the body. The problem to be solved is to reduce the particulate contamination.

2. claims: 26-33

This invention pertains to a substrate lifting assembly to lift a substrate from a substrate support and transport the substrate. The problem to be solved is to minimize the contact between the substrate and substrate support.

3. claims: 34-44

This invention pertains to a heat exchanging support including a body having a substrate receiving surface and a heat exchanger. The problem to be solved is improve the thermal conductivity between the substrate and the support.

4. claims: 45-48

This invention refers to a substrate transport system to transport a substrate onto a substrate support in a process chamber comprising a controller, a transfer arm and a substrate lifting system. The problem to be solved is to improve the control of the movement of transport arm.

5. claims: 49-51

This invention concerns a substrate processing apparatus comprising a process chamber, a transfer arm, a detector and controller. The problem to be solved is to improve the substrate processing.

6. claim: 54

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This invention concerns a multi chamber substrate processing apparatus comprising a transfer chamber, a heating chamber, a pre-clean chamber, a deposition chamber, a cool-down chamber, lifting assemblies and a controller.
The problem to be solved is to reduce the metal contamination below a certain level in the apparatus.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2005/005672

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
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